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Cities as Anticipatory Systems

Analyzing "Weak Signals" to Explore beyond the Predictability of Their Future

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In the last decade, Future Studies have developed a very important corpus of theory and methods aimed to analyze the future of cities. Meanwhile the world is confronted with major challenges like climate change, global pandemics, migration, inequality and poverty, government agencies, professional urbanists, academia and other organizations, concerned with strategic planning, are looking for new ways to provide insight into how we approach unforeseeable challenges and integrate complexity and novelty for better futures.

In this paper we reviewed the notion of "weak signal" as a retrospective exploratory method to think of cities as anticipatory systems (Boer, Wiekens, and Damhof 2018) of future emerging problems.Using qualitative retrospective analysis and secondary research we focused on three urban innovations in transportation, workplaces and food domains at different cities to understand how to anticipate unforeseen scenarios and explore new ways of generating possible perspectives of the future.

Our findings showed that some urban innovations are preceded by a group of weak signals (usually low in visibility or too diffuse) that need to incorporate more robust signals in their own context but could be a starting point to identify people's underlying assumptions, to sketch collective scenarios and increase their capacity to think about the present in order to move toward a desired and possible future, concept that Miller (2011) describes as "Future Literacy".

Keywords: Weak signals, Anticipation, Futures Literacy, Sharing Cities.

INTRODUCTION

In recent decades, a new meta-narrative has emerged about the future as being predominantly urban, where cities are protagonist places that have the conditions to develop socio-technical innovation, capable of transit toward a sustainable future (Irwin, Tonkinwise, and Kossoff 2020).

Adding to this, there is a trend of proliferation of citizen labs, hubs and Think-Tank's worldwide, dedicated to promoting future scenarios building for STEEP (Social, technology, economic, ecology and politics) sectors, (Brenner, 2018).

In a recent study about future production in cities (Gonzalez-Arellano 2019), we identify two main visions: the fictional, opposed to the non-fiction one. The first one, includes a science fiction view of the future and encompasses a variety of media and literature genres, (comics, video games and movies). Among this prolific media production, there are two main dichotomous perspectives: the utopian versus the dystopian city where we can find a variety of emerging topics: conflicts of planetary urbanization, relations between the constructed world and nature, impacting in societal alienation, an oppressive centralized power and effects against human freedom, the transformation of spatio-temporal relations, and prominence of information and biotechnologies incorporated in urban life. (Collie, 2011).

There is also another group of future visions, the more speculative ones, which aims to provoke a serious reflection about particular situations within the urban environment, usually developed by architects, urban planners, economist and foresight experts, who try to "predict" how cities might operate and look in the future, their efforts are aimed to communicate society about how a city "ought" or "should" behave and it is usually conveyed by a collection of alternative futures. (Dunn, Cureton and Pollastri, 2014). We argue that there is an anticipation character for these kinds of visions since they try to convey a possible and probable future that seeks certain consensus or veracity among urban society.

CITIES AS ANTICIPATORY SYSTEMS

Literature normally identifies schools of thought about the future that correspond to epistemic frames or worldviews that involve certain conceptions or assumptions and their own set of methods. We could group those interested in the production of the future in the interdisciplinary field of Future Studies which has gradually matured a robust corpus of relevant methods, techniques, and experiences. A concept that has particularly caught our attention in Future Studies is the notion of *weak signal*, an approach started by Igor Ansoff as an innovative forecasting tool for management in organization studies that gradually has moved toward other spheres of strategic planning and anticipation. (Miller, Rossel and Jorgensen, 2012).

In this article we understand cities as anticipatory systems, able to develop their capacity to incorporate a sense of "after now" (the future) in the way they work, make decisions, operate, and imagine in a more active role than simply contemplative or passive one.

Here is a more concrete example using Robert Poli's claim: "Anticipation occurs when the future is used in action" (Poli 2017). A population growth scenario is not anticipatory but using that information to propose the new transport infrastructure for a city, is instead an anticipatory behavior. To be consistent with Rosen definition (1989) -later taken by Miller and Poli (2018)- an anticipatory system considers at least three elements. The first is the model of a dynamic system. The second is the use of a predictive model of itself and/or its environment. The third incorporates the results of the predictive model into the first model allowing an actualization of the original model.

Cities have long been characterized as dynamic models from different perspectives like in urban economy, climate change, transporting and metabolic systems. All these models are not static, but simplified versions of diverse interactions of variables considering an urban component. Any city at one point, could develop an anticipatory strategy by modifying their present behavior (for example: decide to expand a line in its underground system), or incorporate a predictive model (a city plan or growth scenario based on the tendency to use private cars). By understanding how cities use their anticipation capabilities we could identify those who centralize their processes in government visions or those that use more participatory ones.

Seeing the city as an anticipatory system is more complex than having a centralized decision-making version. The anticipatory system of a city is the set of system updates that make a city based on their own predictive models. Urban systems are very diverse; each city has their own productive processes, services and infrastructures and different ways to deal

with information and food access to their citizens. This diversity makes cities' anticipatory capacities complex, contradictory, and sometimes causes of conflict.

We believe that such conflicts and contradictions don't need to be avoided but are necessary to change cities' perspective toward anticipation. Instead of pursuing actions expecting optimal outcomes, cities need to make decisions under conditions of great uncertainty, and based on contingent interpretations of each situation, and in the context of future co-creation. We think that the weak signal's framework could be a great tool to anticipate cities' futures.

We start by asking what a weak signal is? explore some definitions and examples as well as the evolution of the term. Then we follow with the analysis of three cases of urban innovation through the lenses of emergence and evolution of weak signals. In the next section, we communicate our findings and open the discussion to the implications and potential of the approach in the context of cities' capacities to anticipate, imagine and decide about the future, or at least become aware of their anticipatory assumptions, making it possible to invent more feasible futures. Finally, we reflect on the process of identification and interpretation of weak signals and the need to conceive cities as anticipatory systems in the context of turbulent and uncertain times.

WEAK SIGNALS AND THE FUTURE OF CITIES

The institutionalization of futures has recognized a hegemonic future where most individuals and organizations seem to adopt what can be summarized as a global geopolitical turn with epicenter in the China-India region. This turn is characterized by climate disorder, the economy of decarbonization, technological and biotechnological innovation expansion and demographic transition towards an aged population, migration and, beyond all, a consolidation of the planet's urbanization. (GO Science, 2016).

Three main references stand out in the hegemonic future global agenda for cities: The UN Sustainable Development Goals with their 17 urgent global solutions; The Paris Agreement, addressing mainly climate change and "The New Urban Agenda" adopted at United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador (UN-Habitat, 2016). These agendas convey the global megatrends discourse within a strong normative/prescriptive charge, their main rhetoric focuses on conveying a rational scientific and technological discourse. These agendas produce two main dimensional frameworks: the normative prescriptive and the analytical-descriptive one, leaving a poor capacity/alternative/chance to imagine a "future" beyond this certainty.

Three Paths towards the Future

We observe a growing interest in analyzing future urban scenarios among urban professionals, academics, and government agencies responsible for thinking of a strategy and planning a city. Considering this as a process of institutionalization of the future, we identified three main dimensions:

a. A *regulatory or legislative* dimension, where the future of a city is the result of policies or normative laws, that obliges city's authorities to build a future within certain parameters that are translated into policies.

b. The *normative and value* dimension: The future in question adopts a system of social norms and values that guide citizen's elections and actions. It shows how things ought to be done and legitimize or mediate actions towards achieving certain goals.
c. *Cognitive* dimension: Every city's future needs to share a set of concepts, languages, frameworks, traditions, and beliefs within a culture that usually adhere to organizations and individuals.

These three dimensions aim to institutionalize the future vision and establish a frame that accommodates the system regulations, norms and values, assumptions and knowledge of individuals and collectives (Scott, 2008).

WEAK SIGNAL FRAMEWORK

The notion of 'weak signal' as an approach to study the future started around 70 years ago with Igor Ansoff, an applied mathematician with considerable interdisciplinary interests, in 1974 he pioneered an innovative approach for management and strategic planning in business, aimed to help managers in organizations to make decisions in time of great uncertainty (Rossel, 2012). The concept of weak or early signal has evolved and was adopted in the field of future studies. In the last two decades it has evolved conceptually as well as technologically through the development of a variety of registration and interpretation methods that have produced data mining and robust algorithms (Ahlqvist & Uotila, 2020; Holopainen & Toivonen, 2012).

The general hypothesis surrounding 'weak signals' is as follows: any change or event that occurs inside an organization or its environment is preceded by some form of "warning" or signal, eventually observable by individuals or organizations with certain skills, that after captured and interpreted could be associated with possible events or phenomena in the future. Weak signals refer to imprecise early signs of possible changes –but not confirmed– that could happen further in time. Later, these signals turn into more meaningful indicators of critical forces, sufficiently visible and concrete that can help managers avoid strategic threats, or help develop business innovations, they might also foresee a potential impact of a novel phenomenon, change of a paradigm, a trend, drivers, or discontinuities (Saritas & Smith, 2011). The intensity, number and visibility of the signals is variable, at early stages they are characterized by a poor or faint visibility, but they become stronger and recognizable therefore clearer to interpret, as they move closer to the phenomena or event they precede. (Fig 1.0)

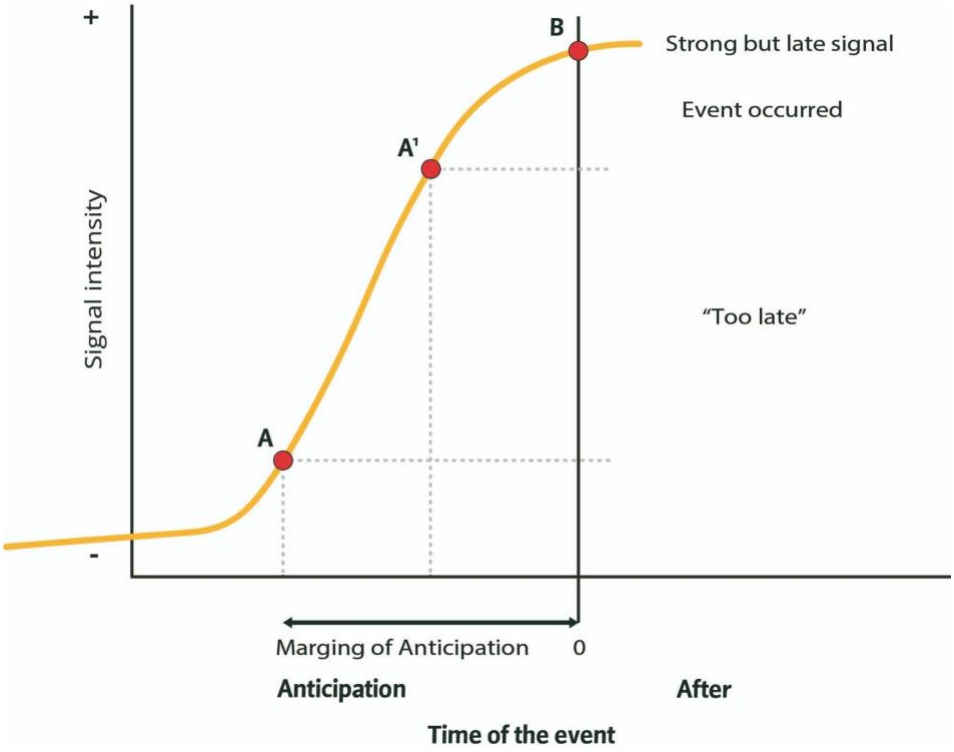

Figure 1. Line graph diagram showing the evolution of a weak signal adaptation Nora Morales and Salomon González from (Lesca and Lesca 2011).

Definition

Weak signals are "seemingly random" or disconnected pieces of information that at first appear to be background noise but can be recognized as part of a significant pattern by viewing it through a different frame or connecting it with other pieces of information. (Schoemaker and Day 2009).

According to the Ansoffian tradition a weak signal has 4 distinctive features:

1. *Novelty*. The signal points toward a new perspective or unknown prospect
2. *Surprise*. It causes some strangeness or astonishment to its analyst
3. *Challenging*. It causes some tension in the assumptions of the interpreter, involving some difficulty to detect and tends to go unnoticed.
4. *Delay*. The sign describes something significant that takes time to mature.

From a Future Literacy perspective, thinking and imagining future scenarios is an individual and collective competence skill that can be translated into a series of practical skills in the decision-making process and the ability to anticipate a phenomenon. (Miller 2018). In this sense, weak signals become relevant in a situation that indicates the emergence of a new trend or the slowdown of an existing one. It can be considered as an indicator of an emergent phenomenon when it is associated with the disappearance or slowdown of an existing process.

Problems Concerning Weak Signals

Some aspects in the contemporary weak signal debate draw some concerns related to the delimitation of the concept and the relation between the actual signal and the phenomena they precede. We argue that considering the type of event to determine the nature of the signal that precedes it, constitutes a bias that can make it difficult to identify and interpret. In other words: the magnitude, the nature, the degree of innovation or the plausibility of an event, should not be a source to discriminate or filter weak signals. This position calls for a need to broaden the conceptual and methodological framework to well-known, low-impact and more familiar events (Holopainen & Toivonen, 2012).

While weak signals are often associated with the anticipation of high-impact, innovative, or disruptive events, we consider that it is useful to amplify the notion to more familiar and everyday life events, which are preceded with a series of early signals. Those kinds of events could be natural in their origin, biophysical like the rain, a flu, or even animal gestation processes or a season. Many of us might seem too familiarized with these events, to even reflect that they are also preceded by weak signals, easy to identify and to interpret, not only by humans but animals. There are many other examples of events originated by humans that could benefit from the analysis with the lenses of weak signals. Some political social sciences studies have identified early signals that warn of a possible coup attempt to overthrow a government or change in regime. (Kraus 2020). Economics is another field that has also benefited from the early identification of a repertoire of "symptoms" or signals that anticipate a great recession, inflation, or unemployment.

METHODS AND DATA

Using a retrospective methodology to analyze weak signal trajectories of emergent events in the urban context, we selected three cases aimed to track the evolution of an early signal. We focused on three urban innovations: a) The adoption of sharing bike systems b) The emergence of Coworking spaces, and c) new modes of urban prepared food processes "Dark Kitchen". All three urban cases take place at different moments and geographies. Urban Sharing Bicycle systems *(USBS)* started in the 60's, the first coworking space (CW) was registered in 2005 and the Dark Kitchen's phenomena (DK) is a recent urban expression that started to emerge around 2017.

For the diagnostic phase we reviewed various sources of literature of each theme to trace the historic and geographic evolution of weak signals and identify groups of key actors participating in the process of innovation. The signals were analyzed according to Elina Hiltunen's Three Dimensions method, using a semiotic triadic model of the future sign in three dimensional spaces (Hiltunen, 2008):

1. The *Signal.* the number and visibility of the signal
2. The *Issue* or *Topic.* depends on the variety of order units describing the diffusion of the phenomenon
3. The *Interpretation.* the receiver's understanding of the future sign's meaning.

Adding to Hiltunen's framework, we consider that interpretation and contextualization of the signals require the aggregation of other signals or events that apparently are not directly linked with the topic or inquiry of the future. For each case we have identified those kinds of signals that we call *parallel or contextualized signals.*

The Evolution of Social Innovation

The process of analysis was tailored to consider Manzini's social innovation evolution model which suggests that, once an innovation is identified, it is possible to trace their evolution paths from the early stages until the innovation reaches a maturity phase (Manzini and Coad 2019). Manzini describes three phases in the evolutionary trajectory of a collaborative solution, in relation to patterns of behaviour, organization and negotiations, between stakeholders capable of modulating their relational intensity of interactions, until they reach a *transformative normality* state. The model consists on the following phases:

A *heroic phase*, where activists and creative enthusiasts with certain leadership skills and a practical sense, unite or get together towards a common cause. It invents and puts into practice new ways of being and doing things, generally encouraged by a social movement and usually questions the status-quo. The *Continuity phase* is a more mature proposal which becomes accessible to a wider, less committed public, this stage usually involves a prototype put into practice which makes the advantages visible and tangible giving more continuity and realisms to the project, calling the attention to actors in the political domain who start to recognize the proposal value. Finally, in the *Consolidation phase,* maturity has been achieved, the proposal is feasible and accessible to a less compromised audience; it has reached a more suitable financial and regulatory environment, provoking a change of mentality in citizens who have adapted to new habits and lifestyles that interweave together and may produce new communities of practice in a totally new urban concept. (Manzini and Coad 2019).

TRACKING WEAK SIGNALS WITHIN THREE URBAN INNOVATIONS

Why Are Cities So Important?

In the Global Foresight Summit of 2020, Finnish futurist Eleina Hultinen talked about 10 things that surprised her while she was writing her book: "*Tulossa huomenna"* or "Mega-Trends" (published on Finnish language in 2019), she entitles surprise number #4: "Change the city and change the future", referring to the mega trend of urbanization.

With this statement Hiltunen suggests something very similar to our premise: Cities are hot-spots for understanding the future of this planet, that is why we need to pay more attention to how they are 'using-the-future' (Miller 2018) in the present to anticipate future actions. The special consideration of Megacities (those with a population over 1 million inhabitants) is based on an estimated exponential growth, starting from 10 megacities in 1990, to 41 megacities by 2030 in Asia, Africa, and Latin America regions (Hiltunen 2019). We believe that megacities are breeding grounds for innovation, and, at the same time, they represent the greatest challenges for sustainability. That is why the problems will get worse if we don't do anything. The weak signal framework WSF, as a theory and a practice, is a good way to understand this complexity.

Megacities are complex information ecosystems: dynamic, adaptive, and disruptive by nature, and we believe are good environments to use the WSF, in order to anticipate either threats or opportunities in the future.

We identify three mechanisms that provide an overview of the cognitive model of a city's anticipation capabilities: 1) *Observation systems* of formal and informal surveillance implemented by practitioners and institutional actors participating in the city's governance. Those systems collect data under some bureaucratic internal structures or external sources,

like academic initiatives or external censuses or survey agencies. 2) A city's *cognitive filter* is present through the instruments of observation and media used, which settle the kind of signals worthy of attention. Each city has different organizations and mediatic communication, and ways to control access, which define their own codification processes and manipulation of the information. Based on this filter, we could infer a city's "cognitive model". 3) The *filter of power* is seen through the decisions certain groups of actors prioritize among others, they set the general urban agenda and plans of a city.

The information infrastructure of a city counts as an important part of their territorial intelligence systems and the relationships with their citizens. Information infrastructure corresponds to digital and analog technologies as well as new media, and what a city considers valuables. It is generally based on statistical data and management teams that represent the power structure of the city and plays an important role to discriminate certain data as irrelevant. This situation contributes to what some authors have called "organizational cognitive bias", which has the effect of a general reinforcement of the status quo and a blindness towards weak or early signs of future threats or opportunities. (Schoemaker & Day, 2009).

Following the 4 distinctive features suggested by the Ansoffian framework, we developed a descriptive analysis of each case. Starting with a brief introduction, followed by the historical evolution or the signal path in the context, then we consider the "challenging" aspects of the weak signal interpretation, which always emerge through a landscape of constant dispute and tension within a turbulent environment. At this stage, we question the framing of interpretation of the experience and question our own biases and influences

To do so, we ask some questions: What other events or discourses have helped to construct the signal? What is the present social paradigm it privileges in the present and what kind of conflicts trigger among actors? Which assumptions of the future are made preferable and by whom?

Any city innovation carries order disruption, there are some who might benefit from it, and some who wouldn't. We finish our analysis by synthesizing aspects that need to be paid more attention to to create transformative spaces of alternative futures.

URBAN SHARING BIKE SYSTEMS, A KEY AGENDA FOR CITY MOBILITY

Mobility and transport have become one of the main concerns of the global urban agenda. The weak signals that feed the imaginary of future scenarios in this domain consider processes such as modal shift patterns (mainly using the car less or stop using it), transformations of travel patterns, incorporation of telecommunication technologies and changes in the lifestyle (where limits are being pushed to the extreme) and causes clashes of scale in traveling. (Kaufmann and Ravalet 2016). Within these short-term development paths, urban bicycle sharing systems (UBSS) as Fishman (2016) points out, are innovation proposals that have expanded globally and have continued to improve.

Weak Signals Path

One of the pioneer community bicycle initiatives started in the Netherlands in 1965 with the emergence of an activist group led by Luud Schimmelpennink, they painted 50 bicycles in white and put them -without a lock- in the streets of Amsterdam free for everyone to use.

In the beginning the solutions that tried to cover the demands and proposals among a variety of actors and the urban cycling movement were not based on the notion of shared bicycle systems as we know them, but instead sought to fulfil the claims of ecological, economic and health issues.

In Mexico City during the decade of 80's and 90's we can identify early signals regarding this issue as a response to a bicycle activism movement that claimed for safer roads and better air quality, it was the prelude to a war against cars. The influence of other social global movements like sustainability and sharing economy in combination with other trends like the development of mobile information technologies and new models of public-private participation (PPP) for urban services, could explain the consolidation of Urban Sharing Bicycle Systems (USBS) in the city. Although, at one point, if we go back to the traceability of weak signals, the events mentioned above have already escalated in visibility and frequency, in retrospect, we noticed a series of informal activities organized by small citizen groups, like the "night rides" or "bike convoys", operated by cyclist (specially women concerned with their commute security) that get together after working hours and ride back watching each other to their home neighborhood, avoiding transport rush hour and others treads. These activities eventually acquire more continuity and visibility, drawing attention from the political city sphere. With the tagline "more cyclists and less pollution" the bicycle activist group transformed their movement into political actions, addressed at the local government and demanded infrastructure, new regulations, and laws. Eventually the public administration supported the events, and the weekend bicycle rides by the end of each month became a popular attraction to the rest of the population. Government authorities helped by closing "Reforma", one of the main avenues in the city, establishing safe circuits around the Historical Center, and provided bicycle stations, organizing rides and, eventually, even a "Bicycle Marathon" (Cyclothon).

Just by themselves these weak signals could not anticipate the development of an urban sharing bicycle system in Mexico City. The innovation wasn't present in the first initiatives organized by the cyclist activist group, they were too small to be noticed but defied the current status quo of a city of 40,000 vehicles and 9,003,827 people. To understand their emergent quality, it was necessary to relate those signals with a pair of social phenomena happening simultaneously. As a practice, the renting of bikes already existed but it was not articulated with a stronger network of bicycle stations (accessibility) that the city provided while supporting the movement. Those stations were distributed among the neighborhoods surrounding the Historic Center area which is, by the way, topographically suitable. The progression of change continued with an intermodal strategy: closing vehicular lanes and adding a bicycle one through the main avenues that lead to the city center, thus providing better public transportation. We cannot forget that the development of mobile locative technologies helped decrease bicycle theft and made payments easier for the public and simplified the logistics for the stations. Finally, we can see a change of vision in the authorities about public space in Mexico City. It has strengthened since the 80's and opened to consideration the possibility of investment and implementation of urban infrastructure in collaboration with non-government actors.

Challenges and Assumptions

We observe some tensions surrounding the use of public space among street restaurant and store owners, and other urban services like parking meter infrastructures and other mobile alternative vehicles stations. The use of public street space is regulated by city authorities based on policies that favor walkability and encourage bicycle use at least in certain neighborhoods but after the COVID-19 pandemic, the government gave permission to restaurants to extend their premises to parking lot lanes to revive the economy.

The right to administer public space is unbalanced, so we see the order of public space as constant demand and negotiation between stakeholders.

What to Look for?

Citizens will continue to use intelligent cards or mobile apps to use different mobility urban sharing systems services: bike, scooter, motorbike, gyroscopic two-wheeled vehicles will continue to develop and will integrate electrical motors al those strategies will focus on solving the "last mile" of the typical urban journey length and connect users to public transport network systems. The emerging urban mobility landscape of the near future on transportation leans toward electric or energy efficient vehicles, integrated GPS devices with less material infrastructure like parking docks or stations. An interesting aspect is that with the post-pandemic increase of delivery of food and goods courier services UBSS would become a key advantage tool for the general workforce.

COWORKING: NEGOTIATING CONVERGENCE BETWEEN WORK AND HOME

Coworking is a special kind of arrangement of working spaces where independent workers and teams share and eventually cooperate, that allow cost savings and convenience using common infrastructures. These kinds of spaces are used by many types of practitioners -many of them independent-, industries and through different knowledge domains. The most common model works as a rental office space where workers have equipment (desk), utilities (wifi connection) receptionist, custodial services (Brown, 2017; Gandini, 2015).

Weak signals path

While the literature cites the first coworking space in 2005 in San Francisco, we can trace some early signs of this initiative, in the September 1983 issue of an article in "American Way" Magazine where the term *virtual office* suggested the possibility of dislocating the regular work tasks involved in an office supported by information and communication technologies -like telephony, computer networks, fax and messaging- already familiar back then. But it wasn't until 1992, that the first business model of virtual rental offices "Business Space Limited" was established in London and, since then, it has been replicated through many places around the world. Although emerging solutions have taken different paths and probably disassociate with the original intentions of coworking spaces. We could identify early signs of delocalization of the workplace that functions as triggers of something closer to remote working or "home office".

The modern notion of "working at home", has an early manifestation that responds to the long commuting hours of the workers at the big metropolis. The term *commuting* in

English refers to the journey that someone takes from home to work and back again, and it caught the attention of academics and policy makers in the 80's and since then, especially in The United States and Europe, started to explore the idea of working at home as a strategy to diminish those journeys starting a debate about cost-benefit and viability. The idea was initially well received by certain types of workers and industry professionals but, at present, after the pandemic has forced the adoptions of new ways of working (Boland *et al.* 2020), there is no consensus on the impact of remote working initiatives and the preferences between workers, supervisors and business employers is clearly divided. Other aspects worth considering for this analysis is the emotional state of the work-at-home professional which relates to social aspects or feeling of isolation due to lack of interaction with other persons that goes with the independent worker at home and was considered by the first coworking initiatives as one of the drivers to offer a shared space.

On the other hand, the practice of doing work meetings in coffee shops or similar spaces accentuated when portable laptop computers and other presentation devices became lighter and enabled communications through digital and mobile technology. So, the step from having job interviews or meetings in coffee shops to working spaces with laptops and wifi connections was continuous and predictable. Internet connectivity becoming more widespread and mobile phone technologies more accessible, were two early aspects that enabled certain types of professionals to look for places outside their work and cities' centers. Another driver is the transformation of both the labor market and an increase in numbers of autonomous freelance workers. Brad Neuberg, considered the founder of the coworking movement in 2005 (DiRisio, 2019). He has the early heroic vision of the movement, starting the preliminary phase inspired by the open-source movement by grouping efforts of collaboration with highly motivated persons that saw the potential and social value to share a workspace.

We can track a series of weak signals that anticipate the emergence of this new typology of spaces, collective groups of architects and artists decide to rent and share a common space usually as an old or abandoned building or storage in the periphery of Chicago metropolitan area, around the 1990s. The rehabilitation of those spaces led to the contemporary loft type housing we can see today. These groups were faced with the difficulty of being able to economically enjoy services and comforts of the urban environment and acted accordingly to adapt and optimize the available space in which they work or live. Another important aspect is that those initiatives questioned the established hegemonic culture--in this case the real estate market. There have been many prototype ideas of coworking spaces that have developed in different contexts, in American history could be tracked to artist colonies, journalist newsrooms and rent-an-office spaces in some cities, but none of them had the open community aspect of coworking. We noticed that these kinds of initiatives could be linked to social movements such as the open-source movement and hackerspaces that appeared in the early 90s in Europe. The sharing economy and the minimalist movement, we would like to stress an emergence of a new young generation called *Digital Nomads* (Makimoto and Manners 1997) –concept used for titles of the novel by Tsugio Makimoto and David Mannersnomadic in 1997.–. As a movement, Digital nomads are more familiar with telecommunications technologies and used them to earn a living and conduct their life in a nomadic manner, they see work as a lifestyle and are location independent, they usually sell several possessions to make travel easier and may also sell or rent their house and are open to share their spaces with others. The foundation of the digital

nomad movement is remote work (Ikea, 2016; Mohn 2014). and one its characterizations is the rejection of traditional nuclear families' ways of cohabitation (De Paula, 2016). All those new behavioral patterns of living and working blurs the limit between the places we have designated for the two activities, if we want to explore new models of coworking, we must look beyond the original concept of shared offices space and look for more flexible and multifunctional fringes of both spaces. The same applies for identifying weak signals regarding this topic, we need to look for early "homely" or relaxation and ludic adaptations to working scenes, as well as "office like" adaptations of life at home much like the brilliant work of ethnoarchaeology by Jeanne E. Arnold captured the middle-class American home in her book *Life at Home in the Twenty-First Century* (Jeanne E. Arnold & Al, 2012).

Challenges and Assumptions

We noticed that coworking as an innovation trend in the urban environment defies some real state regulations and standards, especially among those who get to decide the value of a place. What does it mean to "share" a place and what other kinds of regulation might be put into practice that are not economically based? After the pandemic, coworking spaces became an option for certain labor sectors (technology and office work) but setting aside plenty of other occupations like medical caregivers, delivery services and restaurant and leisure arenas, which require human proximity to execute their work. Even among office or education workers, the remote work alternative after the pandemic showed some gender inequalities and increased domestic violence at home, women working from home had more difficulty balancing both activities. There are some coworking spaces that see this difficulty as an opportunity and are starting to focus on women. Figure. 2.0 shows an advertising campaign in México for a coworking space focused only on mothers, called "co-madre".

What to Look for?

Emerging coworking and remote work initiatives represent one of the most profound signs of transformation in labor and consequently life in contemporary societies; they also set the pace for the new ways of spatiotemporal arrangements in a city. This transformation of a place opens new typologies of innovation for architecture and service design. The new coworking spaces proposals are still in the *continuity phase,* looking for constant replication and prototyping. As many of the sharing economy initiatives they are constantly adapting to context, compromising urban normative and regulation in real estate as well as new sanitary laws. We need to consider some disruptive changes in the urban shared spaces, especially after the COVID-19 Pandemic.

Before the pandemic, coworking visibility had reached the interest of the political sphere to a degree that certain economies, mainly Asian and Latin American, where governments were starting to plan new regulatory policies for remote work and started to recognize alternative places for remunerated activities than those established by the employer. At least it opened the questions of which occupations require physical presence at the center of employment and which hybrid models and resources could help employees work remotely and continue with better productivity while maintaining social security and health standards.

"DARK KITCHENS", EMERGING SPACES OF PRODUCTION AND DISTRIBUTION OF URBAN FOOD

Urban Food Systems have been showing early signals of the radical transformation of the relations humans have with food and their impact on health and sustainability of the planet in the future. Some of them may be interpreted through the lens of what some authors have named the great food transition. (Kampers & Fresco, 2017). As expected, any change in urban food systems (UFS) carries a spatial dimension among the emergence of new practices that impact the future of the city's ecosystem and inhabitants. Some examples of these practices are new spaces of food production in urban agriculture, proliferation of local markets in public spaces, consumer cooperatives worried about nutritional aspects. There are many innovative strategies that focus on one aspect of the whole food supply chain process. An urban initiative of production isn't only grown on land but involves fishing and aquaculture as well. The food transport, distribution and sale phases have incorporated digital technologies by using on-line and digital platforms, as well as delivering services that take a meal or groceries to your door. There are also innovations in new forms of food preparation and the places to consume it, as well as new initiatives concerned with food waste that try to diminish or recycle it. (Steel et al., 2020).

In this case, we will center on one innovation strategy that deals with one of the main places of preparation and food consumption: the kitchen, the main operation and production heart of a food system. A "Dark Kitchen" (DK) or "ghost kitchen" is an innovation model that incorporates the operational activities of a kitchen but without a public face (Nunn 2021) and consists of multiplying virtual points of selling of restaurant, caterers, and wholesale business by sharing the same kitchen space. Having the same operational space means that different food businesses could share ingredients, equipment, and employers to supply multiple product brands. While DK models can vary, the traditional model focuses on maximizing efficiency and keeping operational costs down to expand to online delivery orders. In practice this means that a client could order any kind of food: Indian, Italian, hamburgers, or pizza from different restaurants but it all comes from the same place. (Bromwich, 2019).

The initiative is trying to reach the restaurant sector in many cities by adapting to different contexts and focusing on serving diners to different consumers either at home or in the office using alliances with delivery aggregator apps like *Doordash* and *Uber Eats* which are entering into the Dark Kitchens game by offering kitchen space and equipment for restaurant businesses to rent.

Weak Signals Path

If we try to identify the first signs of this phenomenon, we go back to the emergence of digital platforms such as KITCH in France (Bridet, 2020), which based their offer on an exclusive tasting variety of food to customers willing to pay for it. The first registered DK startup was *Maple* in New York City, which started in 2015 and closed in 2017. (Bromwich, 2019). Digging in the term connotation of "ghost", referred us to more clandestine purposes. An NBC article, in 2015, exposed some restaurant owners in New York who were listing their restaurant under multiple brands and using their kitchens under different names and addresses to skip inspection grades.

This liminal connotation could be linked to "Speakeasies" private unlicensed barrooms and restaurants in Chicago and New York, back in the Prohibition in the late 1920s which created an underground nightclub culture where jazz fit the mood and have evolved to their contemporary version "Speakeasy" culinary and music "illicit" events located temporarily on warehouses, stores or places with non-commercial land use. The DK phenomena clearly questions the "status quo" of kitchens as places of food preparation and follows an economic logic in terms by getting rid of service operators, waiters, storefronts, and high rental costs anchored to one location.

As a business model, DK emerged with the digitization of information in combination with the rapid growth in consumer demand for restaurant delivery meals. They have clearly occupied their place in the food economy and start-up sector and are waving for the attention of the restaurant sector.

Summing up to these changing attitudes, the restrictive policies caused by the sanitary emergency caused by COVID-19 has forced many food services businesses to look for alternatives to survive. The DK model has become an alternative for the preparation and delivery of food that could hold many businesses together and help share many resources or consumption and infrastructure in the same place.

One of the obvious trajectories of DK relates to "Take-away" restaurants, but we could dig deeper in their genealogy and trace back to the urbanization phenomena and its dynamics: like the "*Fast Food*" movement or the incorporation of women in the force of labor, all those aspect influenced food changes habits of the population of big cities, such as eating alone, shorten the extension of the time slot for eating, and increased diversity of food offerings for each context. To understand the role of these weak signals is essential to trace the consolidation of any innovation and could help us anticipate and imagine the future of a city. These perspectives open the possibility to track convergent paths and coincidences, like with this topic, we could broaden our research to explore the trend to use autonomous cars or drones for food delivery.

Challenges and Assumptions

For this realm, we must question how power and economic structures are distributed among stakeholders of cooking and preparation stages and service providers in restaurants. Also, who gets to manage the whole process and who really benefits from it.

As a practical solution we must question who benefits the most from the sharing of space. The connotation of "hidden" for kitchen activities can carry some negative interpretation in relation to quality control processes causing tensions among regulatory standards for places related to cook preparation.

What's Next

The pandemic effect had led many restaurants to close their doors to the public and adapt their menu to "take-out" and follow new standards of social distance worldwide. The concept of Ghost Kitchens is becoming popular, and it could be an alternative to keep the business afloat. Some indicators show that food sale and delivery at home will have a great boom in major cities (Mexico City increased food delivery service at 55% in 2020 with respect to the previous year).

Central Business districts have been slow to rebound from the pandemic effects, they might need to adapt to more inclusive and affordable means. A prominent consequence of this is that those food service businesses that cannot adapt to the imminent digitization platforms might be doomed to disappear. Cities with a strong orientation toward tourism would converge towards a process of "foodification" where specialized functions are centered predominantly around food.

Innovative transformations of a city rarely arrive without warnings but our own bias and filters function as barriers to identify and interpret their early manifestations. The three urban cases addressed showed diffuse early signals, almost invisible at first, if we analyze them as isolated topics, they are difficult to use as a form of anticipation. So, to interpret *weak signals*, we believe it is necessary to incorporate them to a contextual dimension.

CONCLUSIONS

Identifying weak signals in the context of cities has pointed out a strong spatial component. While innovation flows between cities, there is a strong diffusion pattern of knowledge and experimentation exchange, even if they are distant from each other, cities influence themselves through the processes of adoption and adaptation of innovations. A source of weak signals innovation in one city, starts with the observation and experimentation of what is happening in a distant one. The case of bicycle sharing systems, coworking spaces and DK are concrete examples of the rapid mechanisms and circulation of ideas that cities have worldwide.

Although this project is work in progress, our experience so far shows that weak signals are early warnings circulating from one place to another constantly adjusting and adapting to new contexts.

We noticed two kinds of cities regarding weak signal behavior: for cities where innovation originates, weak signals have to do with experimenting and transformation activities like changes in lifestyles, social habits and customs, technology adaptation or appropriation and for the rest of the cities, weak signals function as early warnings that come from other places and need to adjust or adapt to the new context.

The cases analyzed are examples of emergent models of urban space based on collaborative and commonality principles, even if they come as business initiatives with profitable results in mind (some even questioned regarding their sustainable impact) we cannot deny that these initiatives are based on collaborative way of doing things that expresses a high degree of autonomy, cooperation and solidarity of the parties involved. It should be noted that there is a prevalence of collaborative models in the organization of practices that demonstrate a proliferation of initiatives in cities that have already been identified by some groups, coining the emerging term "Sharing Cities" or "Sharing Spaces" (Chan & Zhang, 2021).

Despite these several challenges we believe that an open and consistent weak signal approach in a city, along with time, could bring the development of capabilities to anticipate to its citizens.

In the last two decades many cities have opened urban observatories; these initiatives correspond to the first steps of development in territorial intelligence, where the identification, collection, and analysis of data of the urban environment is carried out. We consider that observatories are perfect spaces for the incorporation of the weak signals

approach (González Arellano, 2014), Nevertheless most of the urban observatories work with a common cognitive bias that favors quantitative index trends, leaving aside weak signals.

Finally, we believe that cities could act as innovation cultivation spaces, able to use their anticipatory capabilities to start hypotheses for a variety of future-looking knowledge processes (Rossel 2021) enhancing their conscious 'use-the-future' capacity (Rosen 1985) to make it function in ways that are relevant for a diversity of stakeholders.

We hope to inspire readers or listeners to reflect upon exploratory methods to analyze unforeseen futures of certain urban phenomena, question their own assumptions and be curious about how to develop their capacity to imagine new visions of the future with more creativity.

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